Modular Rocket Engine Electric Pumps, Phase I

Completed Technology Project (2018 - 2019)

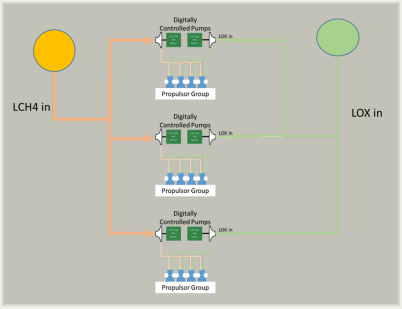
Project Introduction

FTT proposes development of electrically driven liquid oxygen and liquid methane pumps for use in a highly configurable modular rocket engine to dramatically reduce the cost of developing and producing Nano/Micro launch propulsion stages. The modular engine will use an array of digitally controlled electric pump fed thruster modules which produce about 2,400 lbf-thrust each. Power to the modules will come from a centrally located gas-generator powered turbogenerator or a high performance battery pack. The variable speed motors used to drive the pumps could allow for elimination of propellant mixture ratio control valves, gimbals, and bellows. The 2,400 lbf-thrust modules can be configured to deliver almost any thrust combination desired by the propulsion stage prime, foregoing the need to design and develop an expensive purpose built engine. FTT's primary goal will be to substantially reduce the cost of the pump which has a direct linkage to the overall propulsion system cost.

Anticipated Benefits

NASA Applications for the technology include low cost, cryogenic electric pump fed maneuvering thrusters, in addition to low cost booster and upperstage engines as well as Space tug applications where the reusability and safety offered by an electric pump fed engine can be applied. Other applications include pumps for cryogenic thermal management systems to be used in future hybrid electric aircraft.

Commercial Applications for the technology include low cost Nano/Micro launch vehicle propulsion systems requiring pump fed rocket engines in the 2,400 lbf thrust class and above based on customer needs. Spin-off technologies from the high power density cryogenic electric motor development is planned for insertion into FTT's hybrid propulsion and compact high power density power generation for both military and commercial aerospace applications.



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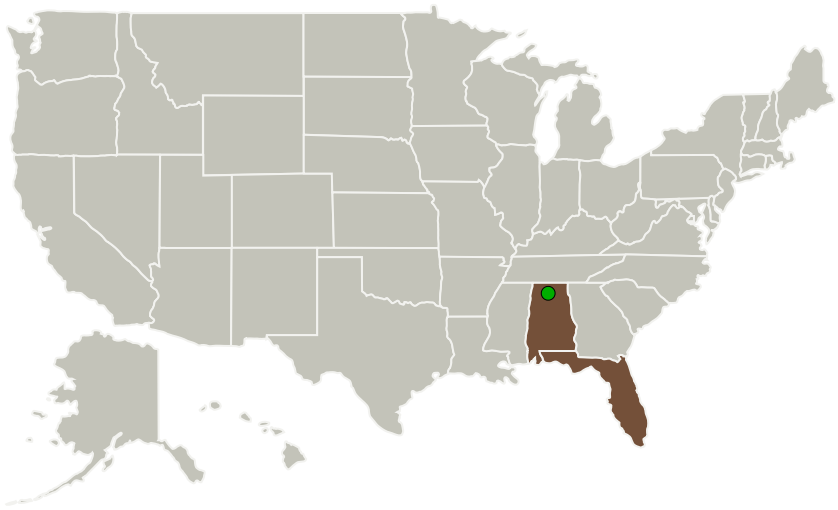
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Florida Turbine Technologies, Inc.	Lead Organization	Industry	Jupiter, Florida
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Florida

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137863)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Florida Turbine Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

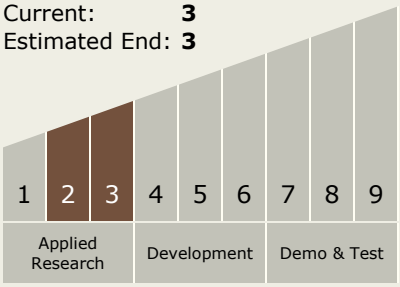
Carlos Torrez

Principal Investigator:

Alex Pinera

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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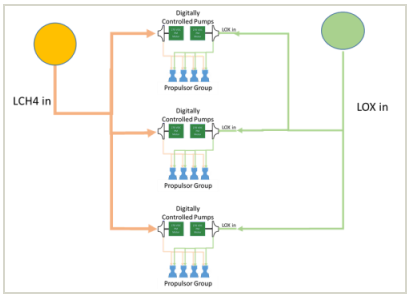
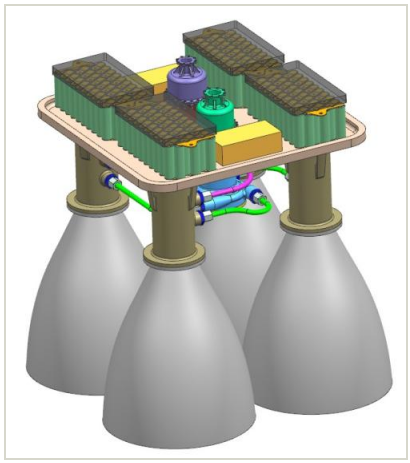
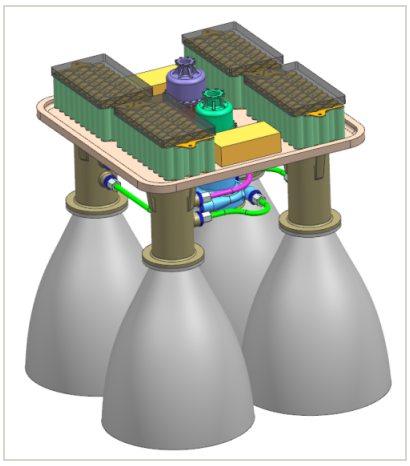
Images



Briefing Chart Image
Modular Rocket Engine Electric Pumps, Phase I
(https://techport.nasa.gov/image/130867)



Final Summary Chart Image
Modular Rocket Engine Electric Pumps, Phase I
(https://techport.nasa.gov/image/127088)



Final Summary Chart Image
Modular Rocket Engine Electric Pumps, Phase I
(https://techport.nasa.gov/image/131689)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destination

Earth